GRADE 12 DIPLOMA EXAMINATION

Biology 30

January 1992

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
BIOLOGY 30

DESCRIPTION

Time allotted: 2½ hours

Total possible marks: 100

This is a **closed-book** examination consisting of **two** parts:

PART A has 70 multiple-choice questions each with a value of one mark.

PART B has five written-response questions for a total of 30 marks.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

GENERAL INSTRUCTIONS

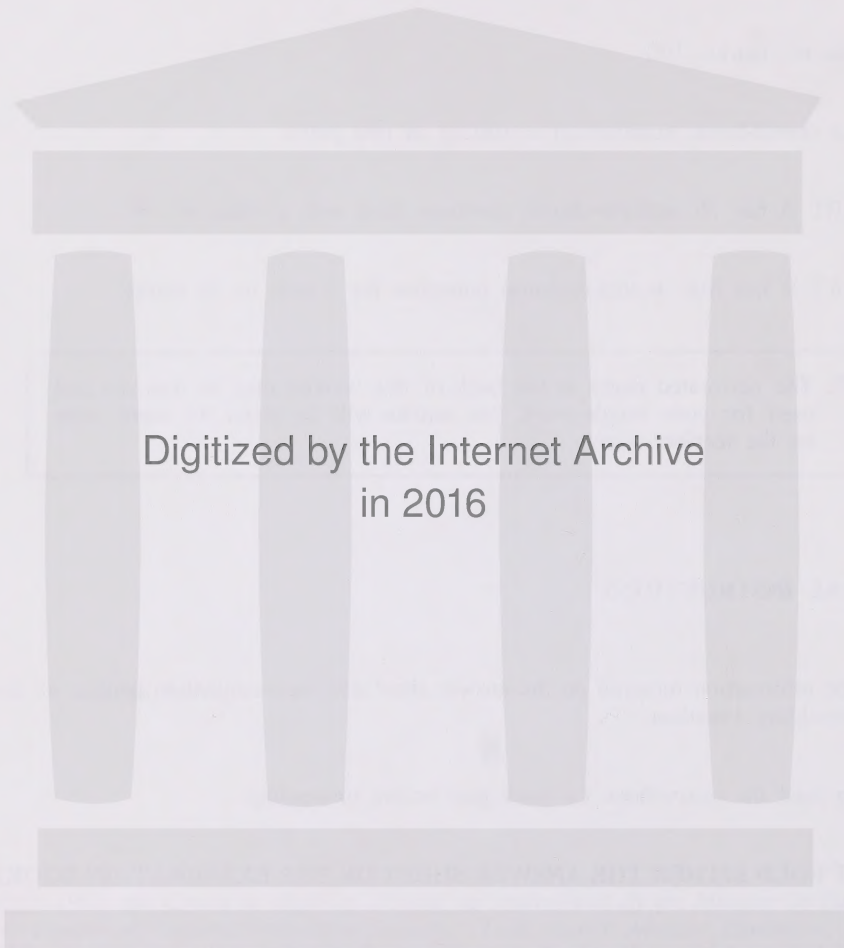
Fill in the information required on the answer sheet and the examination booklet as directed by the presiding examiner.

Carefully read the instructions for each part before proceeding.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect your answer sheet and examination booklet and send them to Alberta Education.

JANUARY 1992



PART A

INSTRUCTIONS

In this part of the examination, there are 70 multiple-choice questions each with a value of one mark.

Read each question carefully and decide which of the choices **best** completes the statement or answers the question. Locate that question number on the separate answer sheet provided and fill in the circle that corresponds to your choice. **Use an HB pencil only**.

Example **Answer Sheet**

This diploma examination is for the subject of ● Ⓑ Ⓒ Ⓓ

A. biology
B. physics
C. chemistry
D. mathematics

If you wish to change an answer, erase your first mark completely.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER.

1. Proteins do not diffuse through the cell membrane because they are

   A. readily denatured
   B. insoluble in water
   C. very large molecules
   D. cell membrane components

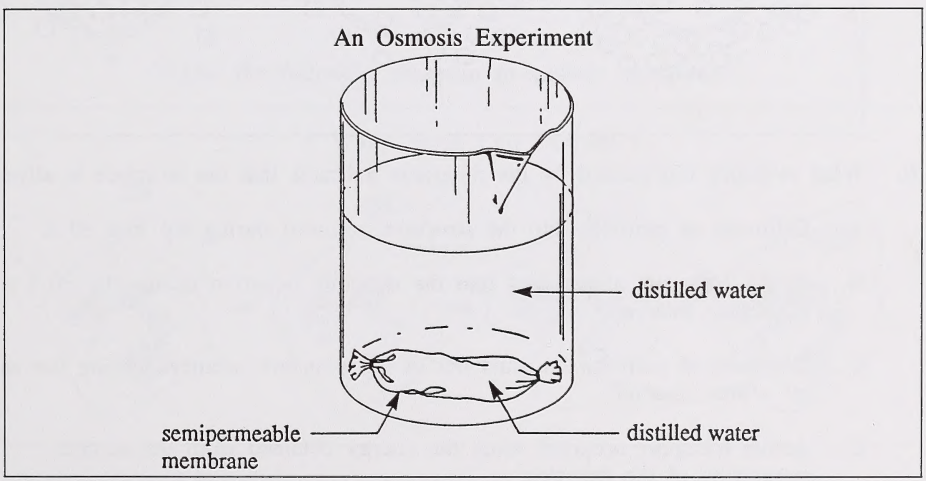
2. Carbon dioxide is produced from the activity of which organelle?

   A. Mitochondrion
   B. Lysosome
   C. Ribosome
   D. Nucleus

3. Lipid-dissolving solvents would cause the greatest damage to the structural organization of

   A. ribosomes
   B. chromosomes
   C. the nucleoplasm
   D. the cell membrane

Use the following diagram to answer question 4.



4. Over a 24-hour period, the mass of water inside the bag will

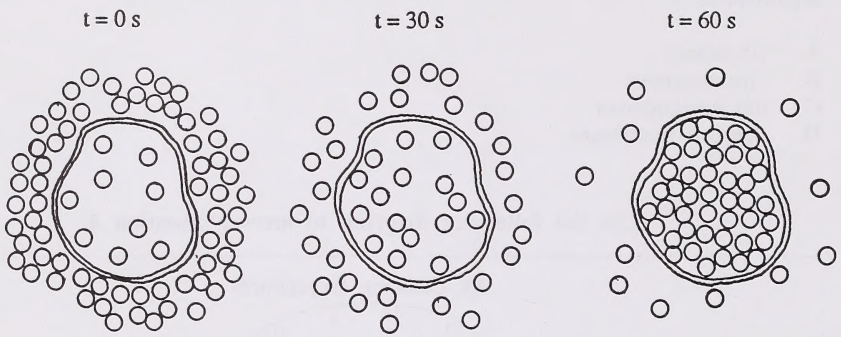
   A. remain the same
   B. increase slightly
   C. decrease slightly
   D. become equal to that outside the bag

5. When a red blood cell is removed from plasma and placed in distilled water, the concentration of water molecules in the blood cell

A. reaches a state of equilibrium before the blood cell bursts
B. reaches a state of equilibrium because of active transport
C. decreases, causing the blood cell to shrink
D. increases, causing the blood cell to swell

Use the following diagrams to answer question 6.

In these diagrams, the small circles represent the particles of a substance. The distribution of the circles represents the relative concentration of the substance inside and outside a membrane-bounded structure during a 60 s time interval. It is not known whether the structure is living or nonliving.



6. What evidence represented by the diagrams indicates that the structure is alive?

A. Diffusion of particles into the structure occurred during the first 30 s.

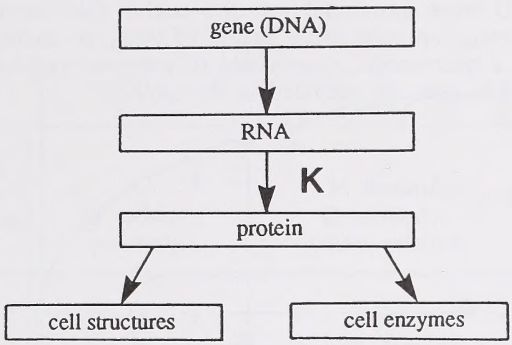
B. Active transport of particles into the structure occurred during the 30 s to 60 s time interval.

C. Diffusion of particles into and out of the structure occurred during the entire 60 s time interval.

D. Active transport occurred using the energy obtained from the aerobic respiration of the particles.

Use the following chart to answer question 7.

A Sequence of Cellular Processes

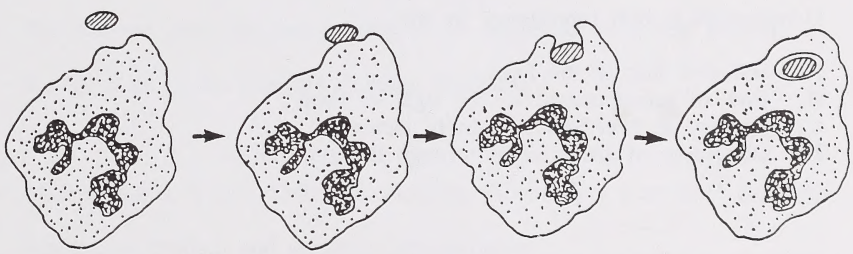


7. In which structure does the process illustrated by arrow K occur?

A. Lysosome
B. Ribosome
C. Nucleolus
D. Mitochondrion

Use the following diagram to answer question 8.

A White Blood Cell Function



8. Which process is shown by this sequence?

A. Lymphocyte formation
B. Antibody production
C. Endocytosis
D. Exocytosis

Use the following information to answer question 9.

A researcher hypothesized that substance Q would increase the secretion of a protein by glandular cells. To test the hypothesis, five different amounts of substance Q were introduced into the culture fluid surrounding live glandular cells. Following an appropriate period of time, an analysis of the culture fluid as well as a microscopic examination of transport vesicles* was carried out for each test. The data are provided in the table.

Test	Amount of Substance Q (relative units)	Number of Vesicles	Concentration of Protein in Culture Fluid (relative units)
I	3.0	17	42.0
II	2.0	15	38.0
III	1.0	8	20.0
IV	trace	2	6.0
V	0.0	1	0.5

*small membranous bubbles that carry products from the Golgi complex

9. From the data, one inference that could be made is that substance Q

A. increases exocytosis
B. increases endocytosis
C. facilitates the diffusion of water into glandular cells
D. facilitates the active transport of ATP into glandular cells

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10. Homeostasis is best represented by the

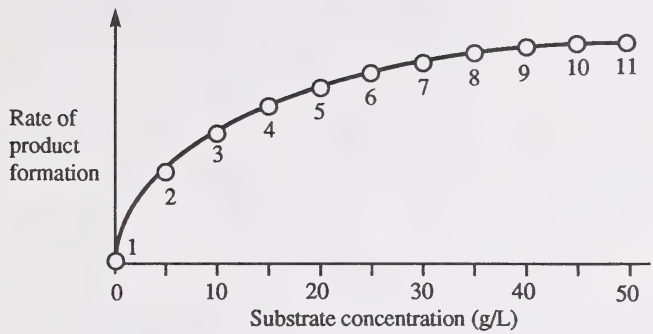
A. reflexive jerk of the knee
B. flow of saliva caused by the sight of food
C. increase in heartbeat as activity increases
D. absorption of amino acids through the gut wall

11. Hydrogen sulphide is harmful because it occupies the active sites of enzymes that function in the electron transfer chain. This chemical process is an example of

A. buffering
B. denaturation
C. negative feedback
D. competitive inhibition

Use the following information to answer questions 12 and 13.

Rate of Product Formation with Increasing Substrate Concentration



Note: In this experiment, different amounts of substrate were added to 11 test tubes containing identical amounts of enzyme. Each test tube was checked for the amount of product formation after the **same time** interval.

12. Which statement explains the levelling off of the rate of product formation as the substrate concentration increases?

A. The number of substrate molecules is exceeding the number of active sites on the enzyme molecules.

B. The product molecules are not being released from the active sites of the enzyme molecules.

C. The enzyme molecules are starting to be denatured by a heat buildup.

D. Energy used in the reaction is being depleted.

13. For reliable results, which additional variables should have been kept constant?

A. Amount of product and substrate concentration
B. Amount of product and number of test tubes
C. Temperature and substrate concentration
D. Temperature and pH

Use the following information to answer question 14.

Some Functions of Organ X

1. Produces antibodies
2. Stores vitamin A
3. Detoxifies alcohol and some other drugs
4. Regulates amino acid levels in the blood

14. Organ X is

A. a lymph gland
B. the pancreas
C. a kidney
D. the liver

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15. In humans, the sequence of stages in the nutritional process is

A. ingestion, absorption, and digestion
B. ingestion, digestion, and absorption
C. digestion, ingestion, and absorption
D. digestion, absorption, and ingestion

16. Which substances produce acidic products when chemically digested?

A. Fats and proteins
B. Carbohydrates and fats
C. Proteins and carbohydrates
D. Nucleic acids and carbohydrates

17. In human tissues, the principal **structural** organic substance is

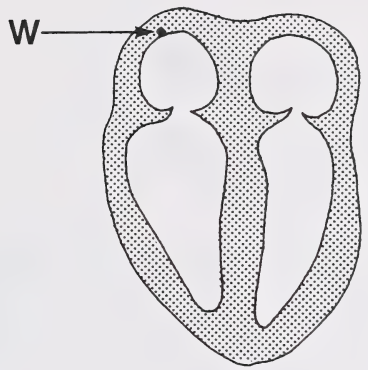
A. fat
B. water
C. protein
D. carbohydrate

18. The left ventricle of the heart pumps blood directly into the

A. aorta
B. pulmonary veins
C. pulmonary arteries
D. superior vena cava

Use the following diagram to answer question 19.

A Longitudinal Section of the Human Heart



19. The heart rate will accelerate if the regulatory structure located at W is stimulated by neurotransmitters released from

A. sympathetic neurons originating in the spinal cord
B. sympathetic neurons originating in the hypothalamus
C. parasympathetic neurons originating in the cerebrum
D. parasympathetic neurons originating in the medulla oblongata

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Use the following information to answer question 20.

In a human fetus, there is an opening between the left atrium and the right atrium of the heart. Shortly after birth this opening usually closes. When this opening does not close, however, the infant is called a ''blue baby'' because the skin has a bluish tint.

20. Which statement is true of an infant with this heart abnormality?

A. Some deoxygenated blood escapes from the pulmonary arteries into the pulmonary veins.

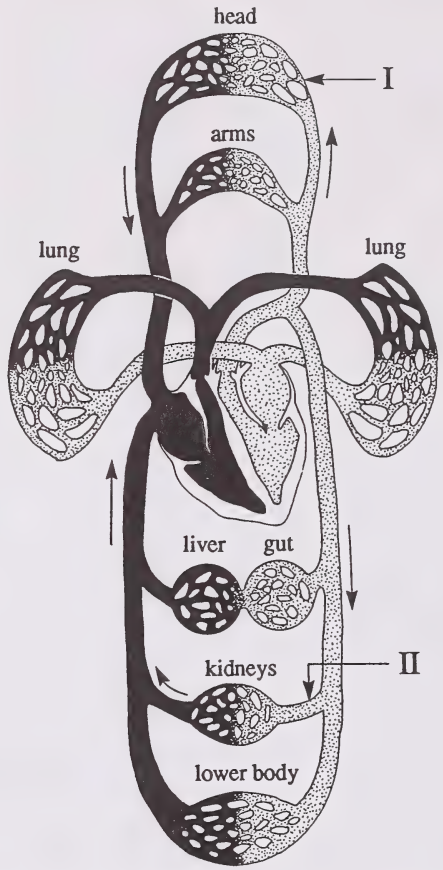
B. Some deoxygenated blood enters the left side of the heart from the right side of the heart.

C. The opening causes a reduction in systemic arterial blood pressure.

D. The level of oxyhemoglobin in the blood is too high.

Use the following diagram to answer questions 21 and 22.

A Schematic Representation of the Human Circulatory System



21. A blockage (blood clot) in the blood vessel labelled I could result in a

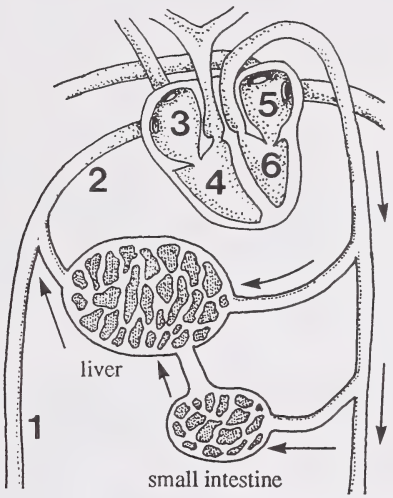
A. stroke
B. cardiac arrest
C. lower concentration of O_2 in the systemic circulation
D. higher concentration of nitrogenous compounds in the systemic circulation

22. A partial blockage in the blood vessel labelled II could result in

A. sugar levels in the urine being higher than normal
B. reduced use of absorbed nutrients by all body cells
C. protein levels in the urine being higher than normal
D. a higher concentration of nitrogenous compounds in the blood

Use the following diagram to answer question 23.

The diagram illustrates the heart, the liver, a section of the small intestine, and some associated blood vessels. The direction of blood flow is indicated by arrows.



23. Which statement about human blood circulation is correct?

A. Blood in the vessel labelled 2 carries a lower concentration of urea than blood in the vessel labelled 1.

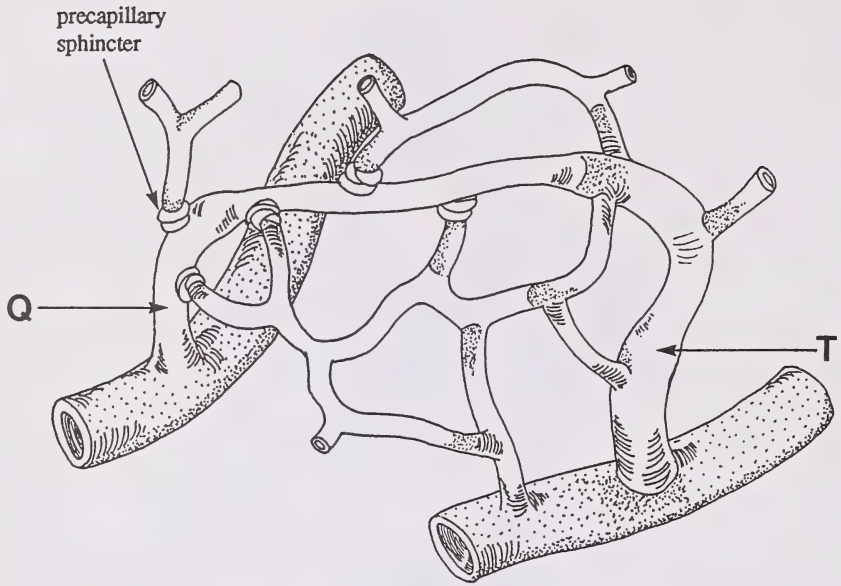
B. Blood leaving the chamber labelled 6 will reach the lungs before blood leaving the chamber labelled 4.

C. Blood entering the chamber labelled 5 has a lower oxygen concentration than blood in the chamber labelled 3.

D. Blood in the vessel labelled 2 has a higher glucose concentration during exercise than blood in the vessel labelled 1.

Use the following diagram to answer question 24.

Capillary Bed Found in Human Muscle Tissue



Note: The amount of blood flowing through a capillary bed is controlled by precapillary sphincters.

24. Compared with blood in the vessel labelled Q, blood in the vessel labelled T has a

A. lower concentration of both O_2 and CO_2
B. higher concentration of both O_2 and CO_2
C. lower concentration of O_2 and a higher concentration of CO_2
D. higher concentration of O_2 and a lower concentration of CO_2

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25. An inadequate supply of which mineral would greatly affect the oxygen-carrying capacity of red blood cells?

A. Iron
B. Iodine
C. Calcium
D. Potassium

26. A person complained of being constantly tired and lacking energy. An analysis of this person's blood would most likely reveal a

A. high platelet count and a low white blood cell count
B. high red blood cell count and a low white blood cell count
C. low red blood cell count and a normal white blood cell count
D. low white blood cell count and a normal red blood cell count

27. Deterioration of the bone marrow results in

A. a decreased cardiac output
B. an increased rate of platelet production
C. an increased rate of white blood cell production
D. a decreased oxygen-carrying capacity of the blood

28. People who live at high altitudes often have a higher percentage of erythrocytes in their blood than those who live at sea level because

A. higher levels of O_2 stimulate the body to increase erythrocyte production

B. lower levels of O_2 stimulate the body to increase erythrocyte production

C. lower levels of CO_2 stimulate the medulla oblongata to increase erythrocyte production

D. higher levels of CO_2 stimulate the medulla oblongata to increase erythrocyte production

29. A person with blood type B has

A. antigen A and antibody B
B. antigen B and antibody A
C. antibody B but no antigens
D. antigen B but no antibodies

30. The exchange of materials between blood and tissue fluid normally occurs at

A. arterioles, venules, and capillaries
B. arterioles and capillaries
C. venules and capillaries
D. capillaries

31. Protein is continuously leaking from capillaries and must be removed from the tissue fluid. A buildup of protein in the tissue fluid results in

A. a decrease in both tissue fluid volume and tissue pressure
B. an increase in both tissue fluid volume and tissue pressure
C. a decrease in tissue fluid volume and an increase in tissue pressure
D. an increase in tissue fluid volume and a decrease in tissue pressure

Use the following information to answer question 32.

In atherosclerosis, fatty deposits called plaques adhere to the inside of arterial walls and restrict the flow of blood. This process has been linked to many forms of cardiovascular disease. The effect of diet and blood cholesterol levels on the development of atherosclerosis has already been well documented. Some researchers, however, suspect that a virus called cytomegalovirus may also be involved. In one study, males having surgery for atherosclerosis were found to possess higher concentrations of antibodies against cytomegalovirus than did a matched group of males who also had high cholesterol levels but no evidence of plaques.

32. From this information, one can conclude that

A. certain viruses may be contributing to atherosclerosis
B. viruses cause cholesterol buildup in arteries of males
C. males undergoing heart surgery all had high cholesterol levels
D. diet and blood cholesterol are the most important causes of atherosclerosis

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33. Emphysema makes breathing difficult because the disease decreases the

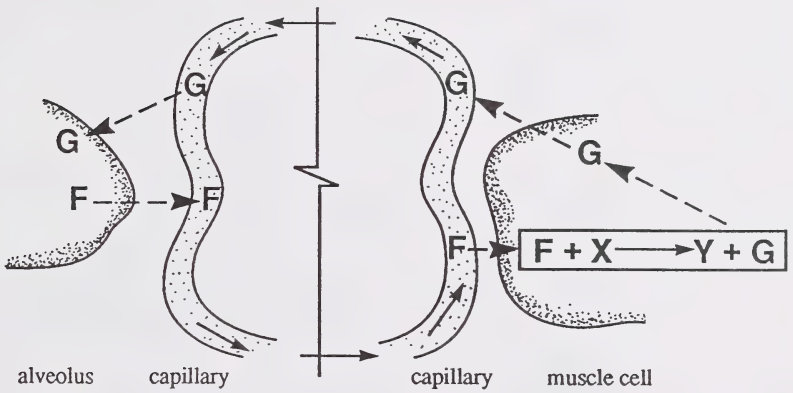
A. alveolar surface area for gas exchange
B. elasticity of the diaphragm and rib muscles
C. concentration of carbon dioxide in the blood
D. stimulation of the breathing centre in the medulla oblongata

34. Which structure of the respiratory system does **not** depend upon cartilaginous support for its function?

A. Bronchus
B. Alveolus
C. Trachea
D. Larynx

Use the following diagram to answer questions 35 and 36.

Substance Movement between Blood and Specialized Structures



35. What are substances F and G respectively?

A. Water and oxygen
B. Carbon dioxide and water
C. Oxygen and carbon dioxide
D. Carbon dioxide and oxygen

36. What is substance X?

A. ATP
B. Glucose
C. Thyroxine
D. Hemoglobin

Use the following information to answer question 37.

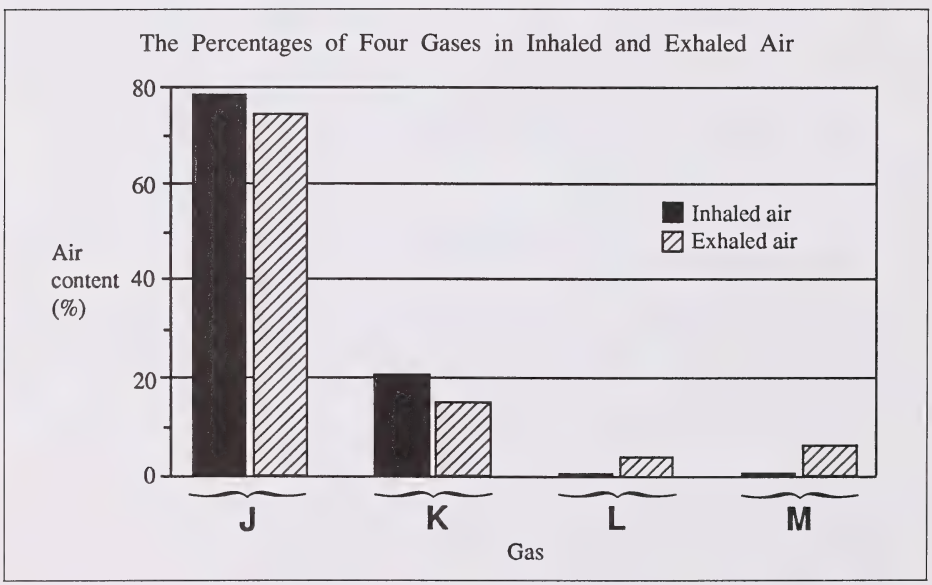
Events Involved in Regulating Gas Exchange

I. Increase in the number of nerve impulses sent from the medulla oblongata to the muscles used for breathing
II. Increase in gas exchange in the lungs
III. Increase in the depth and/or frequency of breathing
IV. Return to normal CO_2 levels in the blood
V. Increase in CO_2 levels in the blood

37. After a person begins to exercise, which sequence of events occurs in the regulation of gas exchange?

A. III, II, V, I, and IV
B. III, V, I, II, and IV
C. V, I, III, II, and IV
D. V, III, II, I, and IV

Use the following graph to answer question 38.



38. Gases L and M are, respectively,

A. oxygen and water vapor
B. oxygen and carbon dioxide
C. carbon dioxide and oxygen
D. carbon dioxide and water vapor

Use the following information to answer question 39.

A Random Order of Steps in the Transfer of Oxygen within the Lungs

I. Oxygen diffuses across alveolar membranes
II. Oxygen dissolves in alveolar wall moisture
III. Oxygen diffuses into plasma through capillary membranes
IV. Oxygen attaches to hemoglobin

39. The sequence that best describes the movement of oxygen from bronchioles to blood capillaries is

A. I, II, III, and IV
B. I, II, IV, and III
C. II, I, III, and IV
D. II, I, IV, and III

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40. Lactic acid accumulation in tissues during strenuous exercise results in

A. muscle fatigue
B. greater CO_2 production
C. greater heat production
D. impaired circulation in the muscles

41. Which statement best describes the use of ATP in body metabolism?

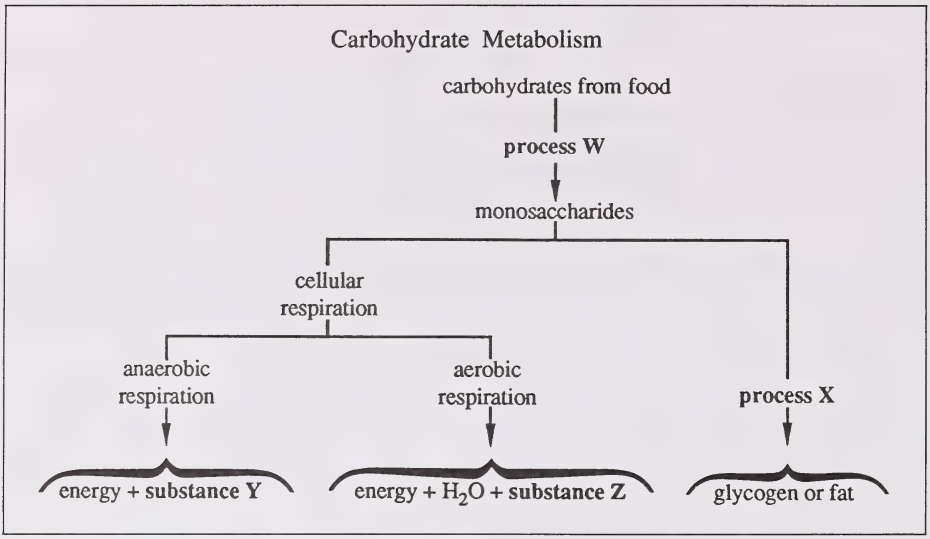
A. Muscle contraction and active transport require ATP, but synthesis of complex molecules releases ATP.

B. Muscle contraction and maintenance of body temperature require ATP, but cell division releases ATP.

C. Synthesis of complex molecules requires ATP, but maintenance of body temperature, active transport, and muscle contraction release ATP.

D. Synthesis of complex molecules, active transport, and maintenance of body temperature require ATP, but hydrogen transfer in mitochondria releases ATP.

Use the following concept map to answer questions 42 and 43.



42. Process W and process X are, respectively,

A. synthesis and digestion
B. digestion and synthesis
C. absorption and synthesis
D. synthesis and absorption

43. Substance Y and substance Z are, respectively,

A. ATP and glucose
B. glucose and ATP
C. lactic acid and CO_2
D. CO_2 and lactic acid

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44. During strenuous athletic activity, such as a long-distance run, the consumption of blood glucose by body cells rises because

A. energy-storing molecules in the muscles are being used up

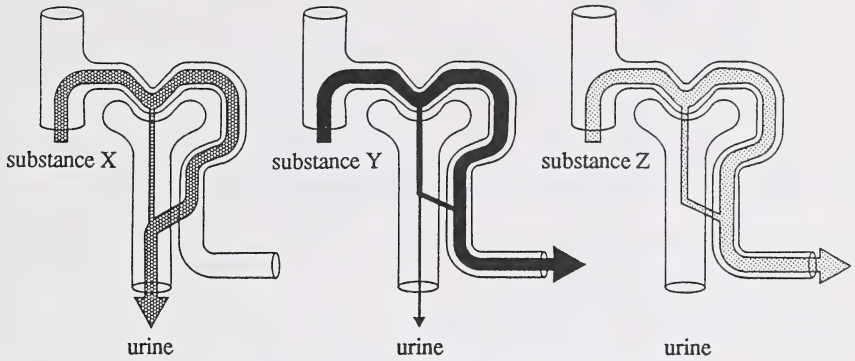
B. digestion of carbohydrates increases, providing more glucose for circulation

C. more ATP is produced by anaerobic respiration than by aerobic respiration

D. fewer ATP molecules are required during anaerobic respiration than during aerobic respiration

Use the following diagrams to answer question 45.

The Movement of Three Substances through a Nephron



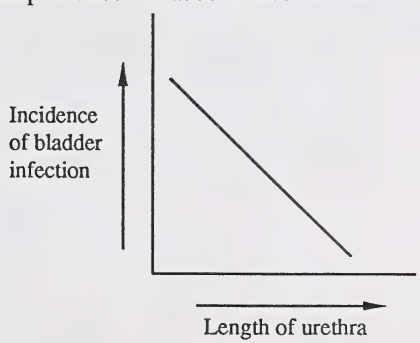
Note: The width of the arrows indicates relative amounts.

45. As substance Y moves through a nephron, it is

A. secreted, reabsorbed, and excreted
B. filtered, reabsorbed, and not excreted
C. secreted, filtered, and partially reabsorbed
D. filtered, partially reabsorbed, and partially excreted

Use the following graph to answer question 46.

The Relationship between Bladder Infection and Length of Urethra



46. The **highest** incidence of bladder infection would be expected in

A. males, because of a long urethra
B. males, because of a short urethra
C. females, because of a long urethra
D. females, because of a short urethra

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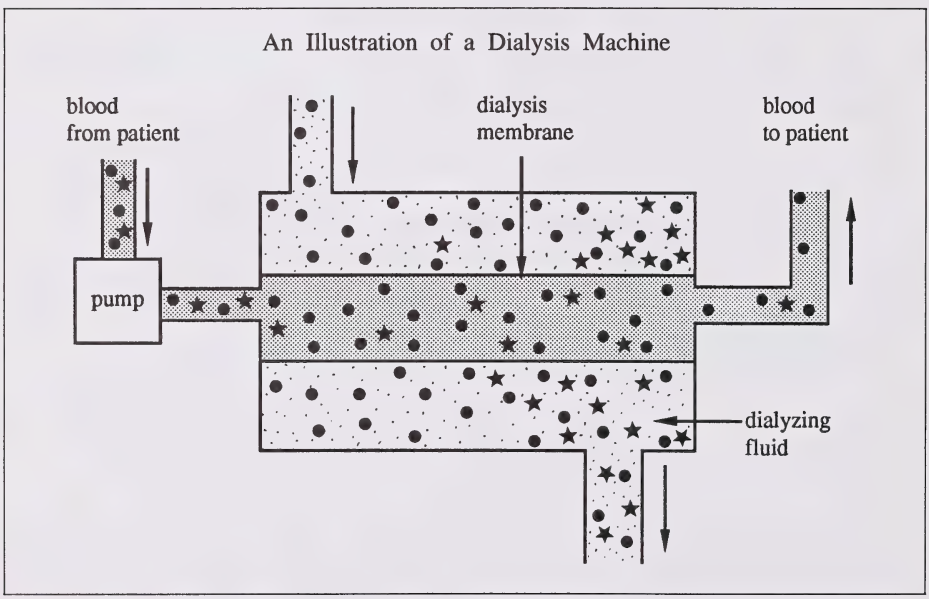
47. Two hormones that regulate blood levels of H_2O, Na^+, and K^+ by acting on kidney tubules are

A. ADH and adrenaline
B. ADH and aldosterone
C. adrenaline and thyroxine
D. thyroxine and aldosterone

48. The major solute excreted by the kidneys is produced by

A. detoxification of poisons
B. deamination of amino acids
C. hydrolysis of excess proteins
D. secretion of excess cellular ions

Use the following diagram to answer question 49.



49. The substance symbolized by the stars is

A. urea
B. glucose
C. protein
D. glycogen

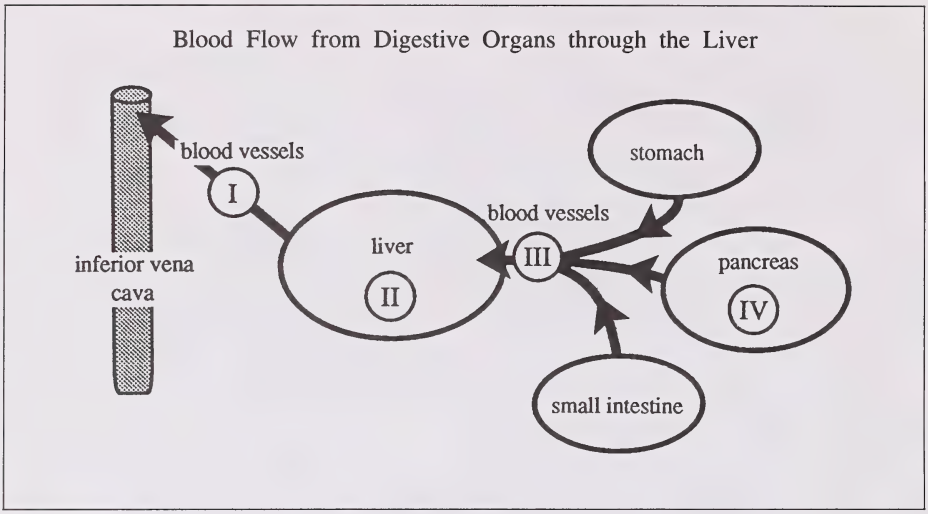
Use the following chart to answer question 50.

Some Blood Components		
Blood Component	Site of Production or Absorption	Description
T	liver and lymphocytes	affects osmotic pressure, works as a buffer, aids in clotting
V	intestines	makes up a major component of the blood, acts as a solvent
W	liver	constitutes a byproduct of the deamination process
X	bone marrow	transports oxygen
Y	small intestine	provides fuel for cells
Z	bone marrow and lymphoid tissue	fights infection by phagocytosis

50. Under normal circumstances, the kidneys excrete which blood components?

A. T and V
B. T and Y
C. V and W
D. X and Z

Use the following diagram to answer question 51.



51. Two or three hours after eating a full meal, a person's blood glucose level

A. is greater at I than at III
B. triggers the conversion of glycogen to glucose at II
C. is greater at III than at I
D. triggers the conversion of glucose to glycogen at IV

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52. While watching a horror film, a person experienced an increased heart rate. This response was likely caused by increased activity of the

A. sympathetic nervous system and increased secretion from the thyroid gland

B. sympathetic nervous system and increased secretion from the adrenal glands

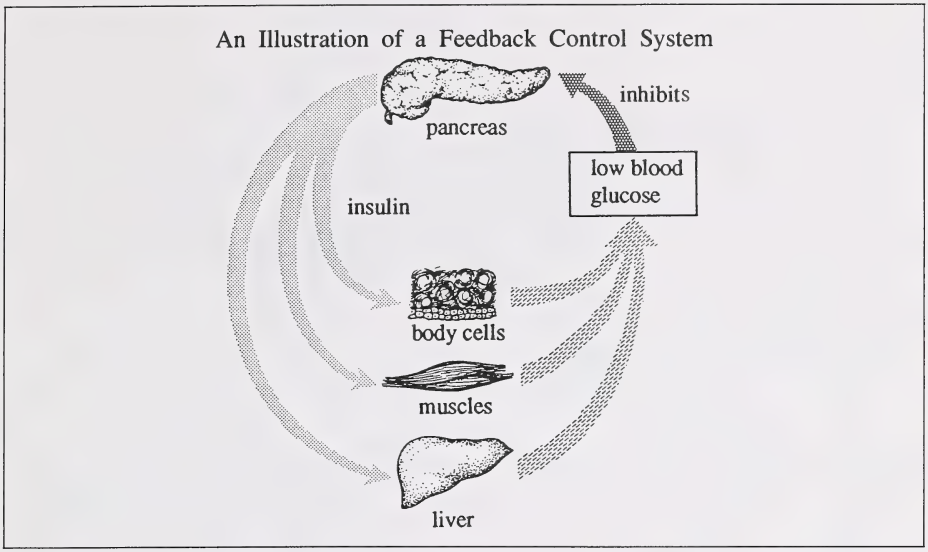
C. parasympathetic nervous system and increased secretion from the thyroid gland

D. parasympathetic nervous system and increased secretion from the pituitary gland

53. Excessive heat production by the body is an indication that the rate of metabolism is too high. The pituitary gland may respond by

A. reducing the supply of TSH
B. increasing the supply of TSH
C. stimulating the thyroid gland to increase the output of thyroxine
D. stimulating the thyroid gland to increase the body's utilization of oxygen

Use the following diagram to answer question 54.



54. The diagram best illustrates the

A. positive feedback control of the amount of blood glucose released from the body cells, muscles, and liver

B. negative feedback control of the amount of blood glucose released from the body cells, muscles, and liver

C. negative feedback control of the amount of insulin released from the pancreas

D. positive feedback control of the amount of insulin released from the pancreas

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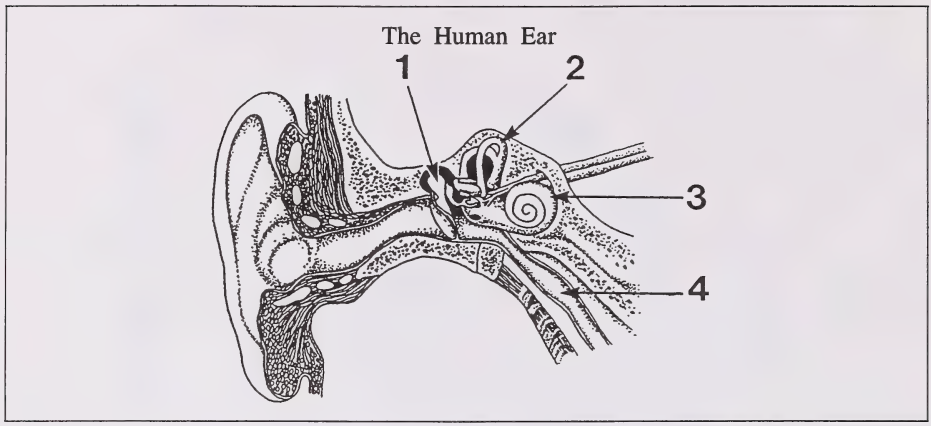
55. Flexibility of the lens in the human eye allows the lens to

A. bend in order to focus the image in front of the retina
B. change shape in order to focus both near and distant objects
C. relax and contract in order to protect the retina from excess light
D. move forward or backward in order to control the amount of light striking the retina

56. The main function of the eustachian tube is to

A. drain fluid from the middle ear
B. conduct sound waves to the eardrum
C. maintain equal air pressure on the eardrum
D. maintain low air pressure in the inner ear

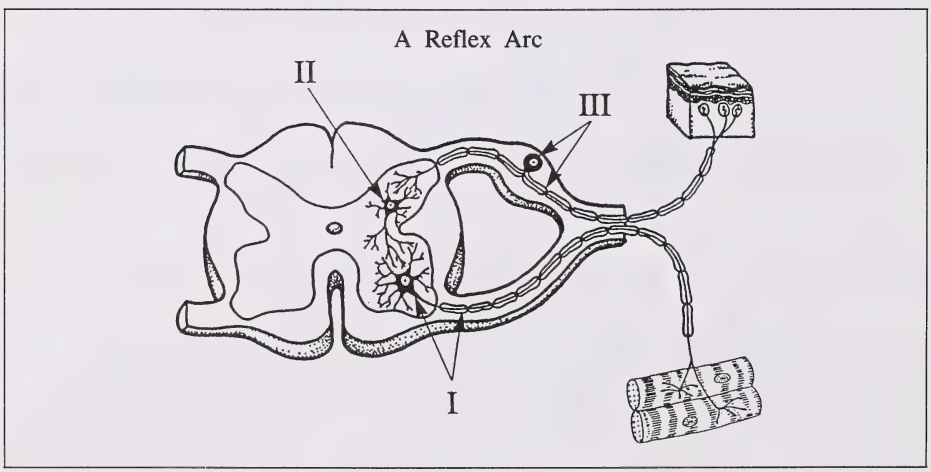
Use the following diagram to answer question 57.



57. The structure in the ear that detects body motion is labelled

A. 1
B. 2
C. 3
D. 4

Use the following diagram to answer question 58.



58. The order in which neurons depolarize in this reflex arc is

A. I, II, and III
B. I, III, and II
C. II, I, and III
D. III, II, and I

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59. The primary function of the myelin sheath is to

A. supply nutrients to the axon

B. increase the speed at which nerve impulses are transmitted

C. act as a storage site for the potassium ions that flow outward during an action potential

D. act as a storage site for the sodium ions before they flow into the axon during an action potential

60. The ability to pick up a pin from a table requires fine motor co-ordination that involves which two areas of the brain?

A. Cerebellum and medulla oblongata
B. Cerebrum and medulla oblongata
C. Cerebrum and hypothalamus
D. Cerebellum and cerebrum

Use the following information to answer question 61.

A number of students listed direct functions of the human skeletal system. Some are correct and others are incorrect.

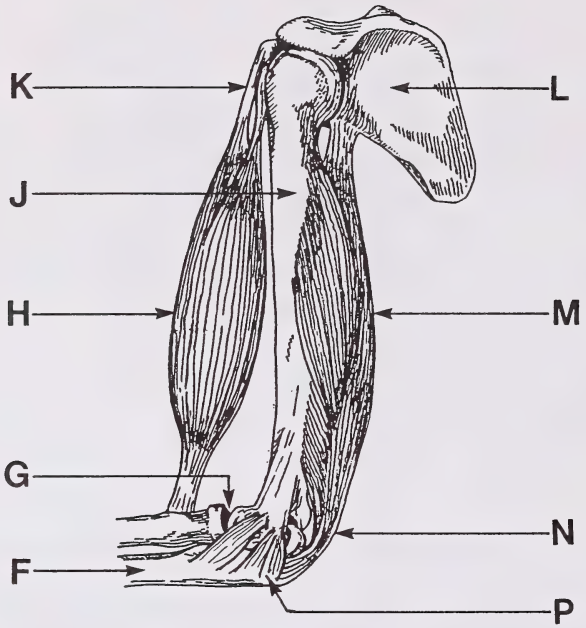
I. Synthesizes antibodies
II. Provides points of attachment for organs such as the lungs and brain
III. Provides points of attachment for muscles
IV. Synthesizes blood cells

61. Which **two** functions are correct?

A. I and IV
B. II and III
C. II and IV
D. III and IV

Use the following diagram to answer questions 62 and 63.

A Portion of the Human Arm



62. A person diagnosed as having arthritis in the arm would have inflamation in which labelled region?

A. G
B. J
C. L
D. N

63. The activities involved in pulling the bone labelled F toward the bone labelled J are

A. contracting H, relaxing M, maintaining K, and stretching P
B. contracting M, relaxing H, maintaining K, and stretching P
C. contracting H, relaxing M, maintaining P, and stretching K
D. contracting M, relaxing H, maintaining P, and stretching K

64. Which process occurs in a muscle during contraction?

A. Oxygen molecules bond with glucose.
B. Energy is produced by the synthesis of glucose.
C. High-energy phosphate bonds break down and release energy.
D. Adenosine diphosphate is converted to adenosine triphosphate.

65. The contraction and relaxation of the muscles of the scrotum is a regulatory mechanism that serves to

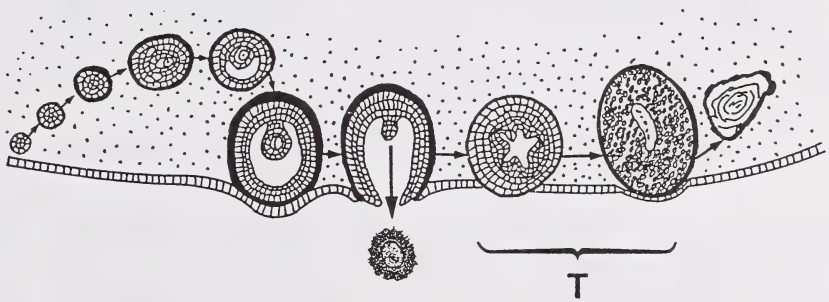
A. control the discharge of semen
B. maintain a fairly constant testicular temperature
C. prevent the delivery of sperm and urine at the same time
D. ensure that the testicular temperature remains the same as the temperature of the rest of the body

66. During the menstrual cycle, a drop in progesterone levels results in

A. formation of the corpus luteum
B. formation of a follicle
C. menstruation
D. ovulation

Use the following diagram to answer question 67.

The Human Ovarian Cycle



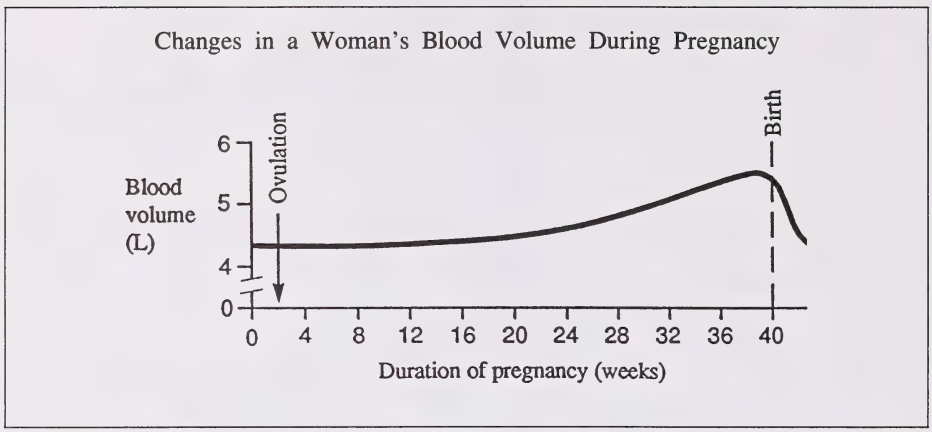
67. Stage T represents which phase of the ovarian cycle?

A. Ovulation
B. Implantation
C. Follicle development
D. Corpus luteum development

68. After an embryo has been implanted in the uterine wall of a human female, there would likely be

A. increased FSH production
B. shedding of the uterine lining
C. decreased progesterone production
D. continued maintenance of the corpus luteum

Use the following graph to answer question 69.



69. Which condition in the fetus is **not** a result of these changes in the woman's blood volume during pregnancy?

A. Increased nutritional demands by the fetus are met by the woman's increased blood volume.

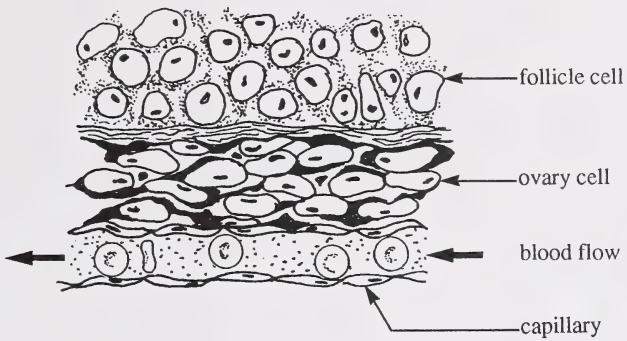
B. Increased respirational demands by the fetus are met by the woman's increased blood volume.

C. Increased exposure of the fetal blood to the woman's blood helps to develop the blood type of the fetus.

D. Increased blood volume in the woman provides for the removal of additional metabolic wastes from the fetus.

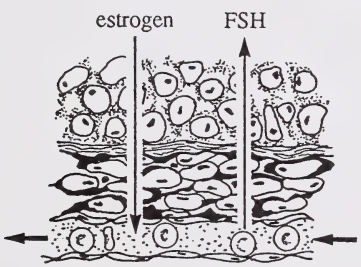
Use the following diagram to answer question 70.

A Capillary in Tissues of a Human Female

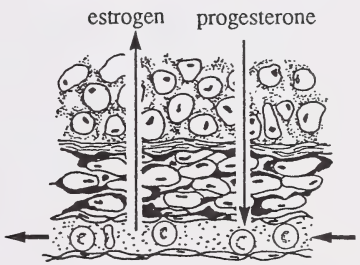


70. Which diagram represents the net movement of hormones to and from a capillary in an ovary?

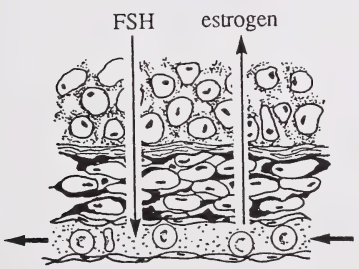
A.



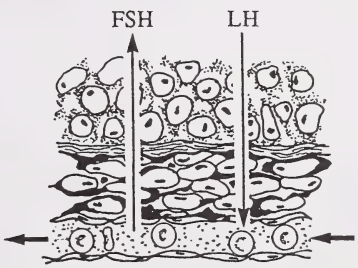
B.



C.



D.



YOU HAVE NOW COMPLETED PART A. PROCEED DIRECTLY TO PART B.

PART B

INSTRUCTIONS

In this part of the examination, there are five written-response questions for a total of 30 marks.

Read each question carefully.

Write your answers in the examination booklet as neatly as possible.

Communicate your answers in clear, complete sentences unless the response format dictates otherwise. Marks will be awarded for pertinent explanations and answers. Question 3 has two marks allotted for written communication skills.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work. **No marks** will be given for work done on the tear-out pages.

START PART B IMMEDIATELY.

Use the following information to answer question 1.

Throughout history, athletes have taken a variety of performance-enhancing stimulants such as caffeine, which is considered harmless when used in moderation. For people who are not accustomed to ingesting caffeine, its effects on various body systems are more noticeable than in heavier caffeine users, who seem to become more tolerant to some of caffeine's effects. With increased use, however, detrimental results such as impaired fine motor co-ordination, sleep interference, increased fatty acid concentrations, and a link with increased heart attacks have all been recorded.

Many athletes believe that drinking coffee before an athletic event will increase their endurance. A number of researchers have recently investigated whether or not caffeine actually enhances endurance. In two studies carried out by different researchers, athletes' endurance was tested after they drank both decaffeinated coffee with caffeine added and decaffeinated coffee without caffeine added. The studies and results are summarized below.

Study 1: This study group comprised nine competitive cyclists cycling at 80% maximum capacity. All nine cyclists performed two trials.

	Trial 1	Trial 2
	Decaffeinated coffee + 330 mg caffeine	Decaffeinated coffee
Average cycling time to exhaustion in minutes	90	75

Study 2: This study group comprised 28 college students cycling at below maximum capacity. The cyclists were divided into two groups. Both groups were given coffee one hour before cycling.

	Group 1	Group 2
	Decaffeinated coffee (250 mL) + 300 mg caffeine	Decaffeinated coffee (250 mL)
Average cycling time to exhaustion in minutes	66	65

Continued

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1. a. What problem were the researchers in these studies investigating? **(1 mark)**

b. Give one reason why decaffeinated coffee with caffeine added was used rather than regular coffee. **(1 mark)**

c. Identify an effect caffeine could have on a specific body structure. Explain how the response of this structure to caffeine would improve an athlete's endurance. **(2 marks)**

d. Compare the two studies and identify **three** features of the experimental designs (other than whether caffeine was ingested) that would affect the results. Explain why these features could produce inconsistent data. **(3 marks)**

Continued

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(1 mark)

e. In Study 1, the cyclists were told before the experiment in which trial they would receive caffeine and in which trial they would not. Explain how this knowledge might have affected the results.

(2 marks)

f. Based on the two studies, what tentative conclusion can be formed about the relationship between caffeine use and athletic endurance? Support your answer by using the data provided.

Use the following information to answer question 2.

An experiment was set up to investigate the effect of pH on enzymes capable of digesting egg white. Equal amounts of cooked egg white were placed in 3 mL of distilled water in each of six test tubes. Other substances were added to each test tube as indicated:

Test tube 1 – pepsinogen and buffer (pH 7)
Test tube 2 – pepsinogen and HCl (pH 2)
Test tube 3 – pepsinogen and NaOH (pH 8)
Test tube 4 – pancreatin* and buffer (pH 7)
Test tube 5 – pancreatin and HCl (pH 2)
Test tube 6 – pancreatin and NaOH (pH 8)

*preparation of enzymes from pancreatic juice

The test tubes and their contents were incubated at 37°C for 24 hours.

2. a. **Predict** and **explain** the results for the following test tubes. **(6 marks)**

Test tube 1 _____

_____

_____

Test tube 2 _____

_____

_____

Test tube 5 _____

_____

_____

Test tube 6 _____

_____

_____

b. Name **one** hormone and explain how it regulates the mechanism for controlling pH in the region of the digestive tract simulated by **either** test tube 2 **or** 6.

Test tube: _____ Hormone: _____

Explanation: _____

_____

_____

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(6 marks)

3. In the small intestine, the digestion of food molecules is completed and absorption occurs. Structures from the circulatory and nervous systems are intimately associated with the small intestine: they are attached to it and penetrate its wall.

Explain how structures from both the circulatory system and the nervous system assist the small intestine in its function.

(**Four** marks will be allotted for concepts and **two** marks for evidence of logical thought expressed with appropriate vocabulary.)

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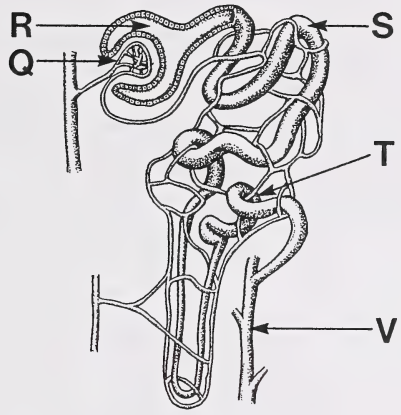
Use the following diagram to answer question 4.

A Human Nephron



4. a. Glucose is found in the fluid of the structures labelled Q, R, and S but **not** in the fluid of the structure labelled V. Explain why. **(4 marks)**

_____

_____

_____

b. Identify **one** major difference in composition between the fluid located in the structure labelled Q and the fluid located in the structure labelled R. Explain.

_____

_____

_____

_____

c. Explain the effect ADH has on the target site labelled T.

_____

_____

_____

_____

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Use the following information to answer question 5.

Some Conditions in the Human Male that can Result in Sterility

I. Mumps, a communicable disease, may cause inflammation of the seminiferous tubules of each testis.

II. Gonorrhea, a sexually transmitted disease, may cause an infection in the epididymis of each testis.

III. Vasectomy, a surgical procedure, removes a portion of each vas deferens.

IV. Undescended testes, which remain in the abdominal cavity, do not function normally.

Note: Sterility in males is a lack of the ability to induce fertilization in an egg.

(4 marks)

5. Explain how each condition can prevent fertilization of an egg.

a. Mumps _____

_____

_____

b. Gonorrhea _____

_____

_____

c. Vasectomy _____

_____

_____

d. Undescended testes _____

_____

_____

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

TEAR-OUT PAGE

(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

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